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U.S. JOINT SERVICE SYSTEMS
APPROACH TO TRAINING DESIGN

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On-schedule deployment, plus effective maintainability and supportability of U.S. military operational weapon systems, depends on the efficient and timely training of the personnel maintaining and operating these systems. Front-end Instructional Systems Development applied early in the weapon system design can assist with developing, testing, and implementing training systems in time to support the deployment of emerging weapon systems. Currently, the Department of Defense is sponsoring the development of a Joint Service Instructional Systems Development/Logistic Support Analysis Record (ISD/LSAR) Decision Support System (DSS) to support the early ISD decision-making process. The ISD/LSAR DSS will provide an automated Joint Service ISD process and an automated LSAR-to-ISD data interface. The automated capabilities will eliminate labor-intensive data handling tasks and allow training analysts and developers to effectively focus on the analyses of training systems requirements. The automation of ISD analysis procedures with flexible data management techniques will streamline the ISD functions, eliminate redundant tasks and data, improve analysis quality and effectiveness, and reduce cost and lead time.

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U.S. JOINT SERVICE SYSTEMS
APPROACH TO TRAINING DESIGN

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SUMMARY

This paper reports on the research and development effort, Joint Service Instructional System Development/Logistic Support Analysis Record Decision Support System (ISD/LSAR DSS) sponsored by the office of the Secretary of Defense, Joint Service Manpower, Training, and Technology Development Program. The DSS consists of data input, ISD analysis, and training design procedures modified to reflect and accommodate service-specific (US Army, US Navy, US Air Force, and US Marines) ISD procedures. The personal computer-based system includes modules that provide system security, database administration, utilities, communications, and report generation, as well as the ISD analysis core. In the ISD analysis modules, the analysis is documented on automated analysis worksheets. The ISD analyst can be supported by decision support logic for selecting tasks for training, selecting instructional settings, selecting training media, sequencing instruction, and identifying training equipment fidelity requirements. Meaningful presentations of LSAR and other analysis-related data support an effective user interface. An audit trail records ISD analysis decisions for later review and modification. A Systems Overview User's Manual fully documents the Joint Service ISD/LSAR DSS design and operation.

The Joint Service ISD/LSAR DSS design and implementation has been completed and is in a formal field-modified test and evaluation phase at several weapon system manufacturers and government training development facilities. Current weapon systems in development that are implementing and evaluating the Joint Service ISD/LSAR DSS include the C-17 Airlifter and the Advanced Tactical Fighter (US Air Force); the Advanced Apache attack helicopter and the LHX Light Helicopter Experimental (US Army); and the P-7A Long Range Air ASW Capability aircraft (US Navy).

PREFACE

This technical paper describes the product developed under contract No.
F33657-86-D-1156/FY7615-87-D016, Joint Service Instructional Systems
Development/Logistic Support Analysis Record Decision Support System (ISD/LSAR
DSS). This work was performed under AFHRL Work Unit 77191911 by Dynamics
Research Corporation. The project was sponsored by the Department of Defense
to support the early ISD decision-making process, to provide an Automated
Joint Service ISD, and an automated LSAR-to-ISD data interface.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

US JOINT SERVICE SYSTEMS APPROACH TO TRAINING DESIGN

I. INTRODUCTION

The Instructional Systems Development (ISD) process is a systems approach consisting of a structured sequence of analytical steps that determine weapon system training system design requirements. ISD considers the relative need and appropriate methods to train each weapon system task/task element, and assesses the skills and knowledge of a target student population. ISD uses an iterative building-block concept to determine a weapon system's training system design requirements and the training to support those requirements.

Manually performing ISD for a weapon system is a slow, labor-intensive process that requires extensive data manipulation. For emerging weapon system designs, the application of ISD would significantly benefit from an automated interface with other systems engineering data and processes. Logistic Support Analysis (LSA) is one process that is ideally suited to support the data needs of early ISD analyses.

LSA is an iterative process that regularly updates a weapon system's design and supportability information through all acquisition phases. The LSA Record (LSAR) is the repository for LSA results. However, neither the LSA process nor the LSAR database is tailored to provide information to the ISD process. As a result, using LSAR data to support ISD is currently a difficult and time-consuming procedure.

II. JOINT SERVICE ISD/LSAR DECISION SUPPORT SYSTEM

For emerging weapon system designs, the application of ISD could be enhanced significantly from the extraction of tasks and other weapon system data using an automated interface with the LSAR. The Joint Service ISD/LSAR Decision Support System (DSS) is being developed to combine automated ISD analysis procedures with an automated LSAR data interface to better support ISD decision making. The Joint Service ISD/LSAR DSS development effort includes in-depth functional analyses of many Joint Service ISD analysis systems. The Joint Service ISD/LSAR DSS incorporates a range of user-selectable ISD tools and techniques to accommodate service-specific and situational analysis requirements. These requirements encompass a range of analyses from front-end analysis to training problem analysis.

Using the Joint Service ISD/LSAR DSS, LSAR data are extracted through a structured format to meet the data requirements of the ISD analysis. Military Standard (MIL-STD) 1388-2A, 20 July 1984, prescribes the data element definitions, data field lengths, and data entry requirements for LSAR data. The Joint Service ISD/LSAR DSS uses data from LSAR A, B, C, D, E, F, and G records are contained in two LSAR master files: the LSA Control Number (LCN) Master File and Task Narrative Master File. Specific LSAR training-related data elements used by the DSS are listed in Table 1. On-line access to LSAR training-related data aids the analyst in performing ISD analyses and in making effective ISD decisions.

Table 1. LSAR Training-Related Data Elements

LSAR DED   Data Element

002   Accessibility
010   Additional-Skill-Requirement
011   Additional-Skills-and-Special-Training Requirements
013   Additional-Training-Requirements
023*   Alternate-LCN-Code
027   Annual-Number-of-Missions
028   Annual-Operating-Days
029   Annual-Operating-Requirements
052*   Card-Sequencing-Code
053   Curtain-Grade
101   Duty-Position-Requiring-New/Revised-Skill
103   Educational-Qualification
106*   End-Stem-Acronym-Code
115   Facilities-Requirements
121   Failure-Detection-Method
122   Failure-Detection-Method-Code
128   Failure-Made-Indicater
152   Harness-Critical-Item
153   Hazardous-Critical-Procedures
155   Hazardous-Maintenance-Procedures-Code
175   Item-Categroy-Code
181*   Item-Name
183   Justification
197*   Logistic-Support-Analyses-Control-Number
204   Maintenance-Concept
205   Maintenance-Ease
220   Measure-Mean-Man-Hour-Per-Skill-Specialty
223   Mean-Man-Minutes
232   Mean-Minute-Elapsed-Time
234   Mean-Mission-Duration
242   Means-of-Detection
244   Measurement-Base
246   Military-Rank
269   Number-of-Persons-Per-Skill-Specialty-Code
285   Operational-Requirement-Indicator
288   Operations/Maintenance-Level
313   Performance-Standards
316*   Person-Identifier
319   Physical-and-Mental-Requirements
354   Quantity-Per-Task
372   Reference-Number
394A   Facilities-Requirements-Code
394B   Training-Equipment-Requirements-Code
394C   Tool/Support-Equipment-Requirement-Code
399   Security-Clearance

Table 1. LSAR Training-Related Data Elements (Concluded)

LSAR DED	Data Element
403*	Sequential-Insertion-Line-Number
406*	Sequential-Line-Number
410*	Sequential-Task-Description
422	Skill-Level-Code
423*	Skill-Specialty-Code
424	SSC-Assigned-New-Duty-Position
433	Skill-Specialty-Evaluation-Code
434A	SSC-from-which-Presonnel-Can-be-Obtained
434B	SSC-from-which-Personnel-can-be-Obtained
451*	Subtask/Task-Element-Code
457	Support-Equipment-Required
467*	Task-Code
468	Task-Condition
469	Task-Criticality
470	Task-Frequency
472*	Task-Identification
473*	Task-ID-Code
479	Technical-Manual-Code
489	Test-Score
502	Training-Location-Rationale
503	Training-Rationale
504	Training-Recommendation
524	Unit-of-Measure
544	Work-Area-Code

VAX Subsystem

LCN Master & Task Narrative Files → *Convert to ASCII* →

VAX Data Extraction and Comparison Routines

1. Extract Records
2. Extract Data Elements from Records
3. Validate Data Elements IAW MIL-STD-1388-2A
4. Compare Data Elements for LSAR Updates

Transfer to ASCII Files on LAN

ASCII Files

A   Operation & Maintenance Requirements

B   Maintainability Characteristics

C   Operation & Maintenance Task Summary

D   Operation & Maintenance Task Analysis

E   Support Equipment Requirements

F   Facility Requirements

G   Skill Evaluation & Justification

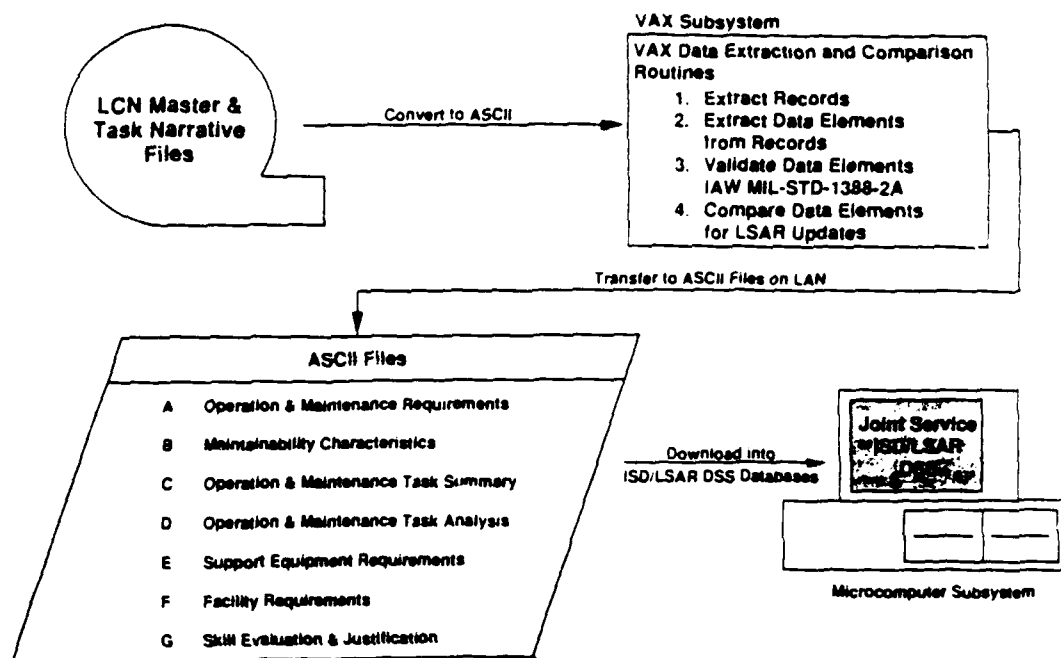*Download into ISD/LSAR DSS Databases* → **Joint Service ISD/LSAR DSS**

Microcomputer Subsystem

Figure 1.   ISD/LSAR DSS LSAR-to-ISD Interface

Table 2.   Joint Service ISD/LSAR DSS User Classifications

	USER CATEGORY				
	Database Administrator (DA)	ISD Program Manager (PM)	ISD Analyst (IA)	Quality Assurance Reviewer (QAR)	Reference File Maintainer (RFM)
Assignment	One per DSS installation	One per Weapon System	One per Skill Specialty per Weapon System	Designated by Weapon System	One per Skill Specialty
Administrative Responsibilities: Data Security	· Grants user access · Assigns RF for specific skill specialty · Designates ISD PMs and QAs for specific weapon system studies	· Assigns subsystem Lead Analysis · Assigns ISD Analysis to study specific skill specialties	· Assigns Task Lead Analysis (Subsystem Lead)	· No data security responsibilities	· No data security responsibilities
LSAR Interface (Administrative)	· Performs LSAR training data extraction (VAX) · Performs LSAR change comparisons · Performs LSAR training data download	· Uses LSAR data to generate ISD subsystem list	· Uses LSAR data to generate subsystem task list (Subsystem Lead) · Uses LSAR data to generate task element list for each task (Task Lead)	· No LSAR interfaces identified at this time	· No LSAR interfaces identified at this time
Other Administrative	· Maintains ISD archives · Maintains library files				· Maintains skill specialty specific files
ISD Analysis Responsibilities: LSAR Interface (Analysis Support)	· No ISD analysis responsibilities	· Prepares weapon system concept background information files	· Uses LSAR data presentations to support analysis decisions	· Uses LSAR data to evaluate ISD Analysis decisions	· Uses LSAR data to help develop Target Population Files
Other ISD			· Performs the full range of training requirements decision-making supported by decision aids	· Reviews and signs off on ISD analyses	

4

The effective interface between LSAR data and the Joint Service ISD/LSAR DSS is displayed in Figure 1. The initial LSAR data processing requires the use of a VAX. The contents of the tape are read, converted to ASCII format, and downloaded into the VAX. The data are checked for validity in accordance with MIL-STD-1388-2A. Once validated, the data are written to the appropriate ASCII-formatted file. If a data element fails the validity check, it is written to an error file. The data are next downloaded into the DSS Local Area Network (LAN) environment. The downloading procedure reads the ASCII-formatted files and writes the elements to the appropriate DSS databases. The information is now available to all analysts that have authorized access. The LSAR training elements are represented to the analyst at the appropriate ISD steps.

The Joint Service ISD/LSAR DSS uses LSAR data in one of two separate ways. First, LSAR data that describe a weapon system s equipment structure, task hierarchy, and task performance requirements provide the ISD analytic structure used by the Joint Service ISD/LSAR DSS. The ISD analyst uses these LSAR data to construct the DSS subsystem, task, task element, and skill/ knowledge hierarchy for each LSAR skill specialty. Relationships between MIL-STD-1388-2A key data elements (LCN/Alternate LSA Control Number (ALC), task code, sequential line number, skill specialty code) are preserved so that the DSS data structures correspond with LSAR data organization.

The second use of LSAR data within the Joint Service ISD/LSAR DSS is to provide information that directly supports front-end ISD analysis decisions. Informational LSAR data elements may only be viewed by the analysts responsible for those particular data. LSAR decision support information is presented to the ISD analyst in the DSS either automatically or in response to a user's request.

An important function of the Joint Service ISD/LSAR DSS data interface is its ability to highlight changes in some LSAR data elements whenever the DSS-LSAR data files are updated. When DSS-LSAR data updates are desired, a new LCN Master Record and Task Narrative files must be created. A comparison of key LSAR data elements in the new LSAR files and the preceding LSAR files is conducted on the VAX. Additions, changes, and deletions of the key elements are presented to the Joint Service ISD/LSAR DSS user for an assessment of the potential impact of the change on ISD decisions that were based upon the earlier information.

Decision Support System Description

The Joint Service ISD/LSAR DSS consists of LSAR data input routines, ISD analysis processes, and modified training design procedures that reflect and accommodate service-specific ISD procedures. The system includes utility functions that provide system security, database administration, report generation, and ISD analysis functions. Within the ISD analysis functions, all analyses are documented and stored on automated worksheets. The ISD analyst is supported by decision support logic for selecting tasks that require training, selecting instructional settings, selecting training media, sequencing instruction, and identifying training equipment fidelity requirements. The DSS presents LSAR and other analysis-related data to the analyst to assist in making these ISD decisions.

5

Within the Joint Service ISD/LSAR DSS, automated ISD analysis and data manipulation steps are organized and sequenced according to approved ISD guidance documents and satisfy many existing and emerging Joint Service training requirements as specified in MIL-STD-1379B/C/D and MIL-T-29053B. Additionally, the DSS serves as a practical demonstration and application of the Computer-aided Acquisition and Logistic Support (CALS) concept.

The Joint Service ISD/LSAR DSS is a powerful tool that performs ISD analyses of emerging weapon systems throughout all phases of the weapon system acquisition cycle. The LSAR interface improves the quality of information exchanges between the parallel ISD and LSA processes. By using the DSS, ISD analysts will b' able to address a wider range of training issues in a more complete fashion. Improved efficiency will result in a reduction in the time required to perform ISD analyses and in high quality, detailed ISD analyses. Both results will generate cost savings by providing either lower-cost ISD analyses or harder-to-quantify savings that result from a better training system design.

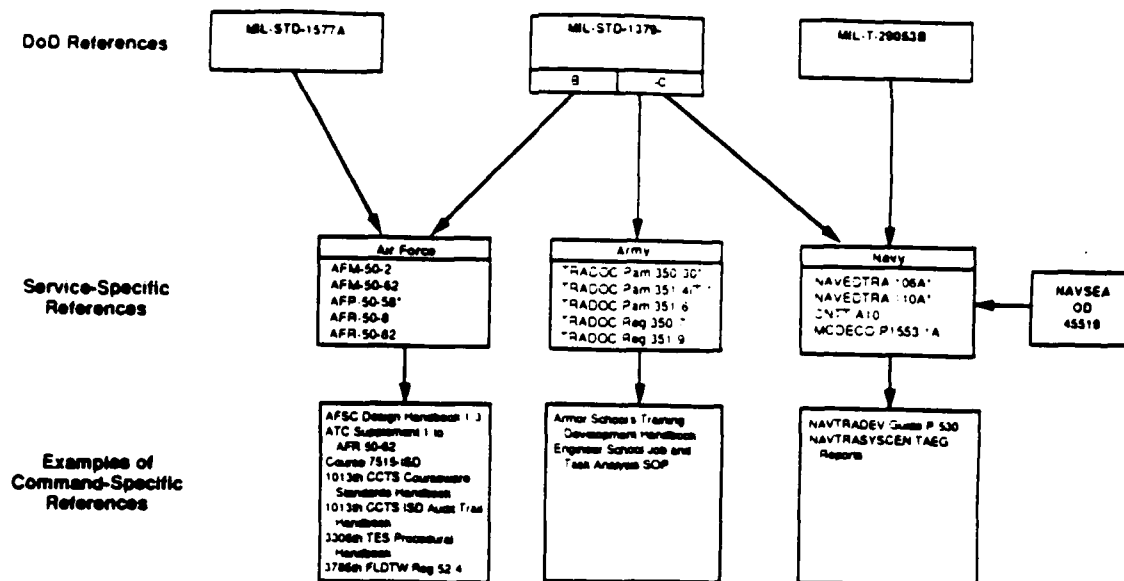## Decision Support System Benefits

The Joint Service ISD/LSAR DSS results in more effective use of ISD analysis time; provides better data control through standard ISD analyses, data handling procedures, and security measures; reduces data handling errors through an automated LSAR data extraction routine; provides easy storage and retrieval of ISD analysis data and results across historical database development for use on subsequent ISD analyses; provides standard and easily accessible ISD analysis results for use by training activities; supports ISD analyses through the entire life cycle of a weapon system; provides data to support ISD analysis coordination and decision making; and provides input to training equipment design specification.

III. DEPARTMENT OF DEFENSE ISD ANALYSIS REQUIREMENTS

ISD-related documentation is prepared at three levels: (1) DoD standards and specifications; (2) service-specific guidelines and doctrines; and (3) individual training activity Standard Operating Procedures (SOPs), implementation manuals, and procedural handbooks. The DSS complies with many of the service-specific guidelines to produce the training products defined by the DoD references and NAVSEA OD 45519. NAVSEA OD 45519 is used by the Submarine Training Community and does not provide clear traceability to the ISD process model. By complying with the service-specific guidelines, the Joint Service ISD/LSAR DSS accommodates many training command-specific requirements.

DoD Standards and Specifications

DoD references do not specifically identify the ISD process, but define the training products that result from the ISD process. These references include MIL-STD-1577A, MIL-STD-1379B/C/D, and MIL-T-29053B. Although any branch of military service may use these references, the primary reference chosen for each service is displayed in Figure 2, Joint Service ISD/LSAR DSS Governing Training Documents. The US Air Force generally uses MIL-STD-1577A and Mil-STD-1379B/D; the US Army uses MIL-STD-1379C/D; and the US Navy uses MIL-STD-1379C/D and MIL-T-29053B.

DoD References

MIL-STD-1577A MIL-STD-1379- [B] [C] MIL-T-290538

Service-Specific
References

Air Force
AFM-50-2
AFM-50-62
AFP-50-58*
AFR-50-8
AFR-50-62

Army
TRADOC Pam 350 30*
TRADOC Pam 351 4T*
TRADOC Pam 351 6
TRADOC Reg 350 *
TRADOC Reg 351 9

Navy
NAVEDTRA 106A*
NAVEDTRA 110A*
CNTT A10
MCDECO P1553 1A

NAVSEA OD 45518

Examples of
Command-Specific
References

AFSC Design Handbook 1 3
ATC Supplement 1 to
    AFR 50-62
Course 7515-ISD
1013th CCTS Courseware
    Standards Handbook
1013th CCTS ISD Audit Trail
    Handbook
3306th TES Procedural
    Handbook
3785th FLDTW Reg 52 4

Armor School's Training
    Development Handbook
Engineer School Job and
    Task Analysis SOP

NAVTRADEV Guide P 530
NAVTRASYSCEN TAEG
    Reports

* Primary References

Figure 2   Joint Service ISD/LSAR DSS Governing Training Documents

LSA Performing Activity

Logistic Support Analysis (LSA) → LSAR Master Data Record File →

LSAR Pre-Processing Activity

Process LSAR Data for ISD/LSAR DSS Input → ISD/LSAR DSS Files

ISD Performing Activity

ISD Analysis   Joint Service ISD/LSAR DSS

LSAR Feedback Reports   Analysis Quality Assurance Reports   ISD Analysis Summaries
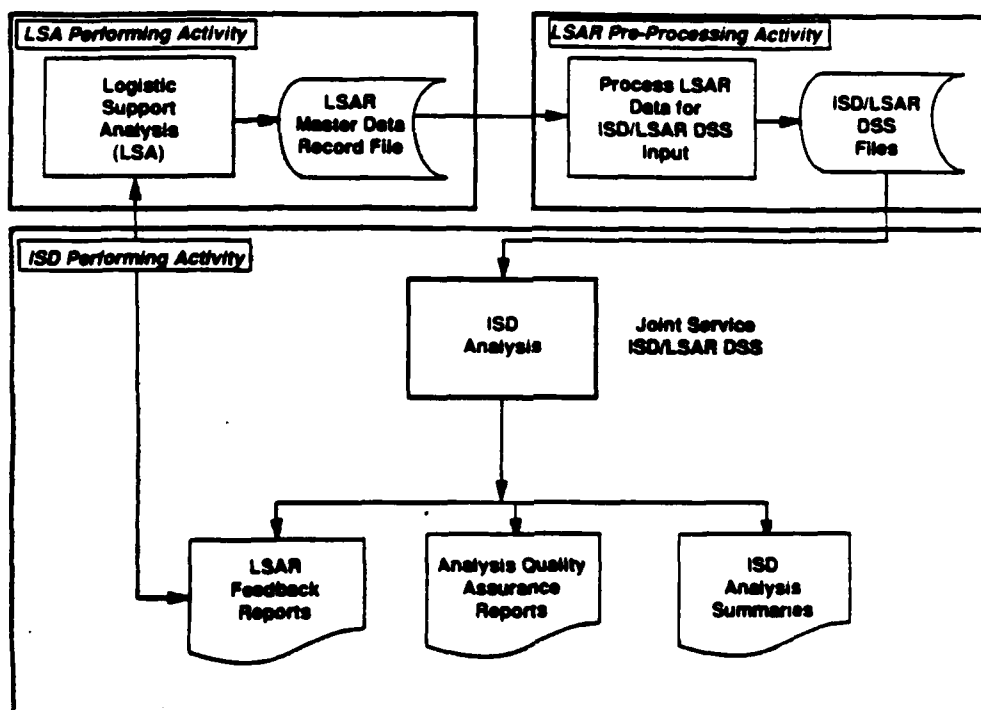
Figure 3   The Joint Service ISD/LSAR DSS Operational Overview

7

IV. SERVICE-SPECIFIC GUIDELINES AND DOCTRINE

Service-specific references generally provide the high-level guidance for performing ISD processes and producing related training products identified by the DoD references. Because it forms the base upon which many service-specific ISD procedures are built, the ISD process resulting from the work of the Interservice Training and Review Organization (ITRO) deserves mention. The ITRO ISD methodology, developed in 1975, is currently the approved interservice procedure for ISD. The ITRO process is divided into five phases, each containing a number of process steps:

Phase I - Analyze

        Block I.1: Analyze Job
        Block I.2: Select Tasks/Functions
        Block I 3: Construct Job Performance Measures
        Block I.4: Analyze Existing Courses
        Block I.5: Select Instructional Setting

Phase II - Design

        Block II.1: Develop Objectives
        Block II.2: Develop Tests
        Block II.3: Describe Entry Behaviors
        Block II.4: Determine Sequence and Structure

Phase III - Develop

        Block III.1: Specify Learning Events/Activities
        Block III.2: Specify Instruction Management Plan and Delivery System
        Block III.3: Review/Selecting Existing Materials
        Block III.4: Develop Instruction
        Block III.5: Validate Instruction

Phase IV - Implement

        Block IV.1: Implement Instructional Management Plan
        Block IV.2: Conduct Instruction

Phase V - Control

        Block V.1: Conduct Internal Evaluation
        Block V.2: Conduct External Evaluation
        Block V.3: Revise System

The ITRO process has not fully satisfied the training analysis needs of all its intended Joint Service users. Each service has adapted the ITRO procedures for its use in developing training for particular types of weapon systems, or conducting ISD in specific analysis environment (e.g., for emerging versus mature systems or varying availability of ISD analysis resources).

In the US Air Force, ISD is governed by two primary references; AFM 50-2: Instructional Systems Development, and AFP 50-58: Handbook for Designers of Instructional Systems. AFM 50-2 directs the application of ISD principles and processes that assist in the development and accomplishment of education and training programs throughout the US Air Force. AFP 50-58 is a six-volume pamphlet that provides guidance in applying the ISD process described in AFM 50-2.

More than any other military service, the US Army directly applies the principles defined in the ITRO ISD methodology, as defined in the six-volume TRADOC PAM 350-30. Identical ITRO procedures are contained in the Navy reference NAVEDTRA 106A. The US Army further clarifies job and task analysis processes in TRADOC PAM 351-4(T): The Job and Task Analysis Handbook and TRADOC PAM 351-6: Job and Task Analysis. The context of TRADOC PAM 351-6 is very similar to TRADOC PAM 351-4(T). The evolution of the Manpower and Personnel Integration (MANPRINT) process and the completion of MIL-STD-1379D will have considerable impact on further definition of the US Army's ISD process.

Although they have accepted the ITRO ISD Methodology in NAVEDTRA 106A, the US Navy's ISD process is chiefly defined by two other primary references; CNTT-A10: Procedures for the Planning, Design, Development, and Management of Navy Technical Training, and NAVEDTRA 110A: Procedures for Instructional Systems Development. CNTT-A10 provides detailed technical guidance on the implementation of all primary training products. NAVEDTRA 110A presents current information concerning implementation of the Navy's ISD process. The US Marine Corps' ISD process more closely resembles the Army's than the Navy's. The primary references for implementing the Marine Corps ISD process is MCDECO P1553.1A: Instructional Systems Development (ISD).

V. JOINT SERVICE SYSTEM DESIGN

The Joint Service ISD/LSAR DSS supports the development of training systems that address the operation, maintenance, and support task requirements of fielded, emerging, and existing weapon systems. To achieve this goal, the DSS design has incorporated three design imperatives: (1) an automated LSAR interface (MIL-STD-1388-2A); (2) methodologically reliable ISD procedures; and (3) flexible user options for service-specific and situational-specific applications. Beyond these design issues, a number of assumptions guide the Joint Service ISD/LSAR DSS development. The general assumptions listed below concern DSS conformance with Joint Service regulatory requirements and standardization initiatives, the profile of projected users, and DSS hardware/software requirements.

> ISD analyses using the Joint Service ISD/LSAR DSS are expected to be substantial development efforts for which LSAR data are available. However, the DSS does support ISD analyses when LSAR data are not available.

> ISD analyses using the DSS will be conducted by analysis teams. The system is intended for use by the master trainer and subject matter experts (SMEs). SMEs must familiarize themselves with the target population that requires training. Structured ISD analysis procedures abbreviate the need for highly skilled training developers.

Organizations using the DSS must have access to a VAX and access to a personnel computer (PC) that is connected in a LAN environment.

DSS design conforms to many of the existing and emerging Joint Service training requirements specified in MIL-STD-1379B/C/D and MIL-T-29053B.

To the greatest degree possible, DSS data element definitions and data relationships adhere to CALS initiatives, through coordination with the DoD/Industry CALS Training Subcommittee.

To the greatest degree possible, the DSS accommodates an automated interface with related, complementary ISD systems. The feasibility of interfacing with the Navy's Authoring Instructional Materials (AIM) and the Army's Automated Systems Approach to Training (ASAT) is currently being evaluated.

The DSS makes use of decision support logic for selecting tasks for training, selecting instructional settings, selecting training media, sequencing instruction, and identifying training equipment fidelity requirements.

Operational Description

The Joint Service ISD/LSAR DSS adapts to a wide range of operational environments. Figure 3 presents an operational overview between the LSA and ISD processes, and depicts the three primary activities involved in the ISD/LSAR information loop: the LSA performing activity, the LSAR Pre-Processing Activity, and the ISD Performing Activity.

The LSA Performing Activity conducts and documents LSA in accordance with MIL-STD-1388-1A, MIL-STD-1388-2A, and specific contract requirements. Despite the possible varied context of LSAR data records, the DSS interfaces with MIL-STD-1388-2A Master Data Record File and Task Narrative File standards. At frequent, regular intervals, the LSA Performing Activity provides the LSAR Master Data Record and Task Narrative Files for input to the DSS. Using the DSS VAX routine, the LSAR Pre-Processing Activity prepares LSAR data files for transfer to the DSS. The ISD Performing Activity is notified when an LSAR data update is available and subsequently downloads the data to the DSS PC network. The ISD analysis can then be updated in response to any new or modified LSAR data. Feedback from the ISD analysis is provided to the LSA Performing Activity via automated reports.

The LSA Performing Activity, the LSAR Pre-Processing Activity, and the ISD Performing Activity may or may not be distinct organizations. For example, a prime contractor may perform the LSA analysis for a weapon system and provide the LSAR data to a government activity which would pre-process the LSAR data and perform the ISD analysis.

System User Classifications

The Joint Service ISD/LSAR DSS has five user classifications: Database Administrator (DA), Program Manager (PM), ISD Analyst (IA), Quality Assurance Reviewer (QAR), and Reference File Maintenance (RFM). Each user class has

specific responsibilities with regard to the management and use of the DSS, as displayed in Table 2.

The Database Administrator prepares the DSS for use when initiating an ISD analysis for a weapon system, updates the LSAR data, grants user access, and maintains ISD analysis data files for all past and present ISD analyses. All of the DA's responsibilities are automated except for the capability of assigning a Reference File Maintainer.

The ISD PM for each weapon system prepares the subsystem list (using LSAR if available) that provides the ISD analysis structure. The PM then assigns a Subsystem Lead Analyst to each subsystem. The PM also assigns to individual analysts responsibility for each skill specialty related to the weapon under analysis. The PM can tailor the DSS for a specific ISD Analysis by describing training system constraints, selecting the tasks selection and media selection models to be used, and choosing a training sequencing approach.

The ISD Analyst conducts the ISD analysis for the assigned weapon system based on skill specialty. The IA has two subcategories; Subsystem Lead Analyst and Task Lead Analyst. Using LSAR data, if available, the Subsystem Lead Analyst prepares the subsystem task list that will be used by all other analysts. The Subsystem Lead Analyst also designates a lead analyst for each task. The Task Lead Analyst prepares a detailed list of task elements for those tasks identified as needing to be trained. All the other IA analysts chose to analyze subsystems, tasks, and task elements from lists previously prepared by the PM, Subsystem Lead, and/or Task Lead. All of the Subsystem and Task Lead responsibilities are automated.

The Quality Assurance Reviewer reviews the analysts' work to ensure that all analysis decisions are well supported and consistent. The QAR is presented with the LSAR data, if available, while reviewing the analyst's resons and rationale for making certain ISD decisions. The QAR's responsibilities are automated.

The Reference File Maintainer is responsible for the development and maintenance of generic duty lists for skill specialties and target population information files. The RFM's responsibilities are not automated due to a requirement to analyze large quantities of data that are most frequently obtained in non-digital format.

DSS Reports

There are three major categories of DSS reports; LSAR Feedback Reports, Analysis Quality Assurance Reports, and ISD Analysis Summary Reports.

LSAR Feedback Reports identify discrepancies between the ISD analysis and LSAR. Those reports are DSS-formatted and serve as the communication link between the LSAR Performing Activity and the ISD Performing Activity. LSAR Feedback Reports include, at a minimum, the following types of reports:

      Subsystem Comparisons
      Task List Comparisons
      Skill Specialty to Tasks Comparisons

Analysis Quality Assurance Reports contain detailed reasons and rationale for arriving at ISD decisions. These reports are DSS-formatted and assist Quality Assurance personnel to evaluate the results of the ISD analysis. Analysis Quality Assurance Reports include, at a minimum, the following types of reports:

> Hardware Evaluation
> Media Selection
> Instructional Setting
> Physical and Functional Fidelity Requirements

ISD Analysis Summary Reports are DSS-formatted. These reports contain the ISD PM to moniter the status of the ISD analysis, and allow the ISD Analyst to review the progress or results of his/her analyses. The ISD summary reports include, at a minimum, the following types of reports:

> Status
> Program Concept Information
> LCN Hierarchies
> Task Lists
> Task Elements Lists
> Instructional Settings
> Training Requirements
> Media Selection
> Hardware Components Lists
> Hardware Fidelity

VI. JOINT SERVICE ISD ANALYSIS APPLICATION

Table 3 displays the applicability of each DSS procedure to the four primary Joint Service training governing documents. As indicated by the legend in the table, the ISD procedure either complies with the reference, conforms to the intent of the reference but employs alternate logic for performing the procedure, is not well defined in the reference, or is beyond the scope of the reference. Table 4 lists the ISD procedures that are automated in the Joint Service ISD/LSAR DSS system and those that will remain manual.

VII. SUMMARY

The Joint Service ISD/LSAR DSS consists of data input, ISD analysis, and training design procedures modified to reflect and accommodate service-specific (US Army, US Navy, US Air Force, and US Marines) ISD procedures. The personal computer-based system includes modules that provide system security, database administration, utilities, communications, and report generation, as well as the ISD analysis core. In the ISD analysis modules, the analysis is documented on automated analysis worksheets. The ISD analyst can be supported by decision support logic for selecting tasks for training, selecting instructional settings, selecting training media, sequencing instruction, and identifying training equipment fidelity requirements. Meaningful presentations of LSAR and other analysis-related data support an effective user interface. An audit trail records ISD analysis decisions for later review and modification. A Systems Overview User's Manual fully documents the Joint Service ISD/LSAR DSS design and operation.

12

ISD PROCEDURES	AFP 50 - 58	TRADOC PAM 351-4 (T)	ITRO Procedures for ISD (1)	NAVEDTRA 110A
Develop and Maintain Job Information	F	F	F	F
Develop Study Description	ND	F	F	ND
Develop Weapon System Subsystem List	F	F	F	F
Develop Target Population Files	ND	F	F	F
Develop Study Job Information	F	F	F	ND
Develop Skill Specialty-Specific Task List	F	F	F	F
Identify Task Conditions, Cues and Standards	F	F	F	F
Select Task Evaluation Model, Criteria Weights, and Selection Cutoff Values	F	F	F	F
Select Tasks for Training	F	F	F	F
Identify Task Elements of Task	F	F	F	F
Identify Task Element Conditions, Cues, and Standards	F	F	F	F
Select Task Elements for Training	C/LD	C/LD	C/LD	F
Identify Skills/Knowledge	F	F	C/LD	ND
Select Skills/Knowledge for Training	F	ND	ND	ND
Cluster Tasks for Instructional Setting Selection	C/LD	ND	F	C/LD
Identify Job Performance Aid Candidate Tasks	F	N/A	F	F
Determine Instructional Setting	F	N/A	F	F
Select Learning Taxonomies	N/A	N/A	C/LD	C/LD
Determine Terminal Learning Objectives for Task	F	N/A	F	F
Determine Learning Domain and Level	N/A	N/A	C/LD	F
Determine Sequence Parameters	C/LD	N/A	C/LD	C/LD
Determine Sequence of Instruction	C/LD	N/A	C/LD	C/LD
Determine Course Structures	F	N/A	C/LD	C/LD
Choose Media Selection Model	F	N/A	F	C/LD
Assign Preliminary Training Media	F	N/A	F	F
Make Final Media Selection	F	N/A	F	F
Build Component List	F	N/A	F	C/LD
Determine Component Fidelity Requirements	C/LD	N/A	C/LD	ND
Combine Fidelity Decisions	C/LD	N/A	ND	ND
Select Instructional Features	F	N/A	F	C/LD

(1) Interservice approved document; identified as TRADOC PAM 350-30 for the Army or NAVEDTRA 106A for the Navy

LEGEND

F	=	Fully complies with governing reference
N/A	=	Not applicable or not addressed
ND	=	Not defined in enough detail in the governing reference
C/LD	=	Conforms to intent of the governing reference but process logic differs

Table 4. Implementation Scope of ISD Procedures

ISD PROCEDURES	IMPLEMENTATION SCOPE
Develop and Maintain Existing Job Information	M
Develop Study Description	F
Develop Weapon System Subsystem List	F
Develop Target Population Files	M
Develop Study Job Information	M
Develop Skill Specialty-Specific Task List	F
Identify Task Conditions, Cues, and Standards	F
Select Task Evaluation Model, Criteria Weights, and Selection Cutoff Values	F
Select Tasks for Training	F
Identify Task Elements of Task	F
Identify Task Element Conditions, Cues, and Standards	F
Select Task Elements for Training	F
Identify Skills/Knowledge	F
Select Skills/Knowledge for Training	F
Cluster Tasks for Instructional Setting Selection	F
Identify Job Performance Aid Candidate Tasks	F
Determine Instructional Setting	F
Select Learning Taxonomies	F
Determine Terminal Learning Objectives for Task	F
Determine Learning Domain and Level	F
Determine Sequence Parameters	F
Determine Sequence of Instruction	F
Determine Course Structures	F
Choose Media Selection Model	F
Assign Preliminary Training Media	F
Make Final Media Selection	F
Build Component List	F
Determine Component Fidelity Requirements	F
Combine Fidelity Decisions	F
Select Instructional Features	F

LEGEND

F = Fully Automated
M = Manual Procedure

The Joint Service ISD/LSAR DSS design and implementation has been completed and is in a formal field-modified test and evaluation phase at several weapon system manufacturers and government training development facilities. Current weapon systems in development that are implementing and evaluating the Joint Service ISD/LSAR DSS include the C-17 Airlifter and the Advanced Tactical Fighter (US Air Force); the Advanced Apache attack helicopter and the LHX Light Helicopter Experimental (US Army); and the P-7A Long Range Air ASW Capability aircraft (US Navy).

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